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PAPERS  
IN  
COLONIES AND TRADE.

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No. I.

ESSENTIAL OIL OF SPRUCE.

*The SILVER MEDAL was voted to J. AYLWIN, Esq. of Quebec, for his Essential Oil of Spruce, a sample of which, and of Copal Varnish, made therewith, is preserved in the Society's Repository.*

THE substance called essence of spruce, and employed chiefly in Germany in the preparation of a particular kind of malt liquor called spruce-beer, is, properly speaking, an extract. It is made in Canada from two species of pine, the *Canadensis* and *Nigra*, by boiling the young shoots in water, straining the liquor, and then cautiously evaporating it to the consistence of a soft extract like treacle.

The extract thus prepared contains a certain quantity of turpentine, to which its peculiar flavour is owing; but the essential oil of the turpentine, in which the odour and flavour chiefly reside, is almost entirely driven off, together with the watery vapour, and dissipated in the air during the boiling and evaporation in an open vessel.

Mr. Aylwin, with a view of improving the quality of the extract of spruce which he is in the habit of preparing,

substituted a common still and worm-tub for the open boiler heretofore used, and thus obtained an extract of better quality than usual, as well as a quantity of essential oil analogous to the oil of turpentine obtained by the distillation of common turpentine. A small proportion of the essential oil was mixed with the extract, in order to improve its flavour; and it became an object of some importance to discover the most profitable use to which the remainder could be applied.

There was no doubt that it would answer the same purpose as common oil of turpentine; but as the cost of obtaining it is considerable (from twenty-five to thirty shillings a gallon, according to Mr. Aylwin), it would be impossible, even under the most favourable circumstances, to afford it at the same price as oil of turpentine.

Some experiments were, therefore, made on its power of dissolving the harder resins, and especially copal, with the view of preparing by means of it a varnish more durable, and less coloured, than common copal varnish. It was found that, when the boiling-hot vapour of this essential oil is brought in contact with copal, the two substances readily unite, and a nearly colourless liquid varnish is the result, which, when spread on the surface of wood, metal, &c., dries speedily and perfectly by the volatilisation of the essential oil, leaving the surface covered with a closely adhering layer of apparently pure copal.

A specimen of this varnish was sent to the Society, together with some of the essential oil.

The varnish was nearly colourless, and very liquid, but contained too small a proportion of copal, which, added to the very hazardous mode of preparing it, greatly diminished the probability of its usefulness in at least this mode of application.

The only very obvious differences between essential oil of spruce and good colourless oil of turpentine are, that the odour of the latter has some resemblance to that of cajeput oil; and its specific gravity compared with that of water is 0·9294, whereas that of oil of turpentine is, when recently rectified, 0·85, and after a year's exposure to light, 0·96. (See "Tingry on Varnishes," p. 262.)

The light oil of turpentine is incapable of dissolving copal; but that which has become heavy by exposure for a year to the sun's light will dissolve it in sufficient proportion to form a varnish. It appeared probable, therefore, that oil of spruce, being heavier than recent oil of turpentine, might also form a varnish with copal. Some was accordingly placed at the disposal of Mr. C. Varley; and the result of that gentleman's experiments is stated in the following letter:—

SIR,

*52 Upper Thornhaugh Street.*

I HAVE tried the effect of the essential oil of spruce, which the Committee of Chemistry placed in my hands, as a solvent of copal, in comparison with spirits of turpentine, and also with a new liquid from condensed oil-gas, which Mr. Faraday favoured me with for that purpose; and the result shews that it is a very good and desirable solvent, for it very nearly equals oil of lavender (a very expensive oil), and surpasses it in purity or freedom from colour. Yet alone it has a very serious defect: it dries so slowly as to require nearly a week to become quite hard, and its solvent power is active enough very soon to soften the paint it is laid on. This would be quite fatal to its use; but by combining alcohol with it the copal is more perfectly dissolved, making a varnish that soon dries, leaving a glossy surface free from tackiness, though it is not quite

hardened till after a day or two ; so that, under these circumstances, it is the best article yet produced for making copal varnish. It is heavier than spirits of turpentine ; and what it dissolves increasing its density, it more nearly approaches that of the softened portion on which the alcohol has the most effect ; and probably it is on that account that they are compatible, for they do not separate. Thus the whole of the copal, though yet ropy, is rendered sufficiently soluble to be used as a varnish ; whereas that made by spirit of turpentine and alcohol always separates into two portions, and, if shaken up, appears white and milky, or soapy, shewing that they are not compatible, and cannot be used together as a varnish ; but when settled, the clear varnish must be poured off : this latter, indeed, is a perfect and excellent varnish, free from colour, and dries quickly ; but it leaves the largest portion of the copal behind ; and if you use that, it spreads ropy, like slimy leather ; and when it feels dry, it will, during a day, rub off like a film of India-rubber, shewing but little adhesion to the surface ; for I must remark, that copal has a tough portion, which requires a year's action of spirits of turpentine only to soften it enough to enable you to stir it. On this portion the alcohol acts, and enables you to obtain as good a varnish in a week as without it would take a year, or otherwise almost continual grinding-up, to wash out all the soluble part. And in all cases the finer the copal is pulverised the quicker is the varnish made, as the tough portion so obstinately fences the soluble part. Heat always quickens the solution, but is injurious, as it almost always developes some colour from colouring-matter accidentally in the copal. I therefore prefer time and frequent shaking up, or excessive grinding, and previously pick out every

visible impurity. I apply the alcohol first in just sufficient quantity thoroughly to wet the powder, as it quickly softens the tough part, and afterwards add the other solvent.

The oil from condensed oil-gas is also a very powerful solvent of copal, leaving a very soft precipitate instead of any tough portion, and quickly dries, free from tackiness, and appears tough, therefore not liable to crack ; but it has a great defect in being so very yellow as to preclude its use in pictures, to which may be added a very disagreeable smell ; but if re-distilling, or any other means can be found to free it from colour, or by purer materials to make it without colour, it would be highly valuable as the best solvent of copal. Alcohol is also beneficial, even with this solvent : but as it is, it may probably serve as a very good varnish or japan in cases where the colour is no object.

I am, &c. &c.

A. AIKIN, *Esq.*

CORNELIUS VARLEY.

*Secretary, &c. &c.*

P.S. This is accompanied with some specimens of copal in the three solvents, with and without alcohol.

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It being considered advisable to have the testimony of some professional varnish-makers on the qualities of the essential oil of spruce as a solvent for copal, a sample was sent for this purpose to Mr. Neil, whose valuable Treatise on Varnishes was printed in the last volume of the Society's Transactions. Mr. Neil accordingly prepared some in the way detailed in the above-mentioned paper, and reported that the oil of spruce is considerably better, as

regards the composition of copal varnish, than the best oil of turpentine that he ever met with.

Portions of this varnish were sent for trial to W. Brockedon, Esq. and H. Singleton, Esq.

Mr. Singleton reported that on trial of the varnish he found it to answer extremely well. Mr. Brockedon's opinion is contained in the subjoined letter :—

29 *Devonshire Street, Queen Square,*  
*Feb. 14, 1834.*

SIR,

I SHALL not return early enough from the country to-morrow to attend the committee, but I cannot help offering my testimony to the excellence of the varnish you sent to me. It is very free in use, and, though thinly spread over, has a good body. It dries rapidly and well. In three different experiments I found that in five or six hours the surface was hard enough to prevent the adhesion of dust. It appears to me to be less liable to *chill* than any varnish that I have ever seen; and I consider it so important an acquisition that I shall be glad to have a pint sent to me from the maker, and to recommend its use as the safest and best varnish that I have ever tried.

I am &c. &c.

A. AIKIN, *Esq.*

WILLIAM BROCKEDON.

*Secretary, &c. &c.*

## CORRIGENDA IN FIRST PART OF VOL. L.

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- Page 11, 5 lines from bottom, for height, and place the connecting bar g, read height and place, the connecting bar g.*
- 13, *line 2, for ; then unclamp read , first unclamping.*
- 14, *5 and 8, for b read l.*
- *16, for lie read lies the bar.*
- 26, *8, after grs. add of morphia.*
- 33, *16, dele working.*
- 39, *3, for latter read former.*
- *10, after to add air and.*
- 53, *8, 11, 27, 31, for bar or bars read arm or arms.*
- *14, for 2 read l.*
- 55, *21, dele subsequently.*
- 57, *14, dele and.*
- 58, *3 from bottom, for c c, which is a front, read which is a front view, c c.*
- 59, *5 from bottom, dele thrown back and, and insert the same in the next following line, after compartment.*
- 63, *5, for covered read high-pressure.*
- 69, *5 from bottom, for right angles read the angle.*
- 84, *9, after horns insert e.*
- 86, *12 from bottom, dele (as in figure 15).*
- 90, *1 and 2, omit alternate.*
- *6, omit half the planks retain their original thickness, and.*
- *9, omit half.*
- 91, *6 from bottom, after separate add in perspective.*
- , *last line, after Fig. 1 add the two other arms of this knee are horizontal, and at right angles to each other, one of them being parallel to the side of the ship, and the other perpendicular to it.*
- 99, *last line, for 1 read 2.*
- 100, *line 1, for 2 read 1.*
- 108, *6 from bottom, read the first part of this sentence as follows :*  
*A straight bar projects from the hinder part of the plate f, and to this is attached a crank g in such a position that the end of its lower arm shall move vertically whenever the bar attached to f is moved horizontally.*
- 109, *4, for ring, twice repeated, read swivel.*
- 110, *23, for the sentence the weight to end of g, substitute the weight l on the spindle i balances the spiral m, the weight o on the crank balances the copper plate and horizontal bar, and another weight at the right hand end of the bar g (not shewn in the engraving), balances the weight of the wire.*
- 144, *4, after entire add machine.*
- 155, *11 from bottom, for shave read have.*